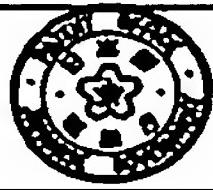


(19)



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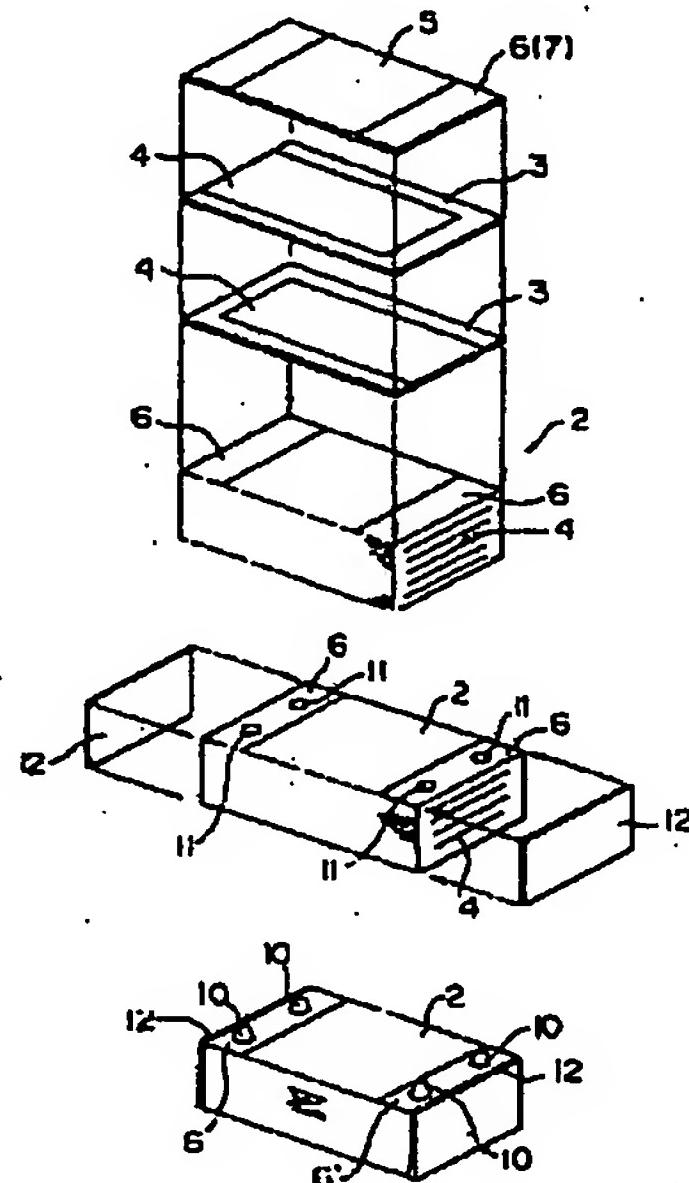
(54) METHOD FOR FORMING BUMP OF LAYERED ELECTRONIC PARTS.

(57) Abstract:

PURPOSE: To obtain a method for forming a bump on layered electronic parts easily and positively without changing a conventional bump-manufacturing process greatly.

CONSTITUTION: A ceramic sheet 5 where an external electrode 6 of a metal without any wetting property for solder is printed at both edges is stacked on a ceramic sheet 3 and the outermost layer of an internal electrode 4 and the entire part is calcined. Then, a lower electrode 12 is connected to the external electrode 6 for interlocking to the internal electrode 4 and at the same time a bump electrode 11 with wetting property for solder is printed at the external electrode 6 while being matched to the bump-mounting position and then bump is piled up on the bump electrode 11, thus forming a bump 10.

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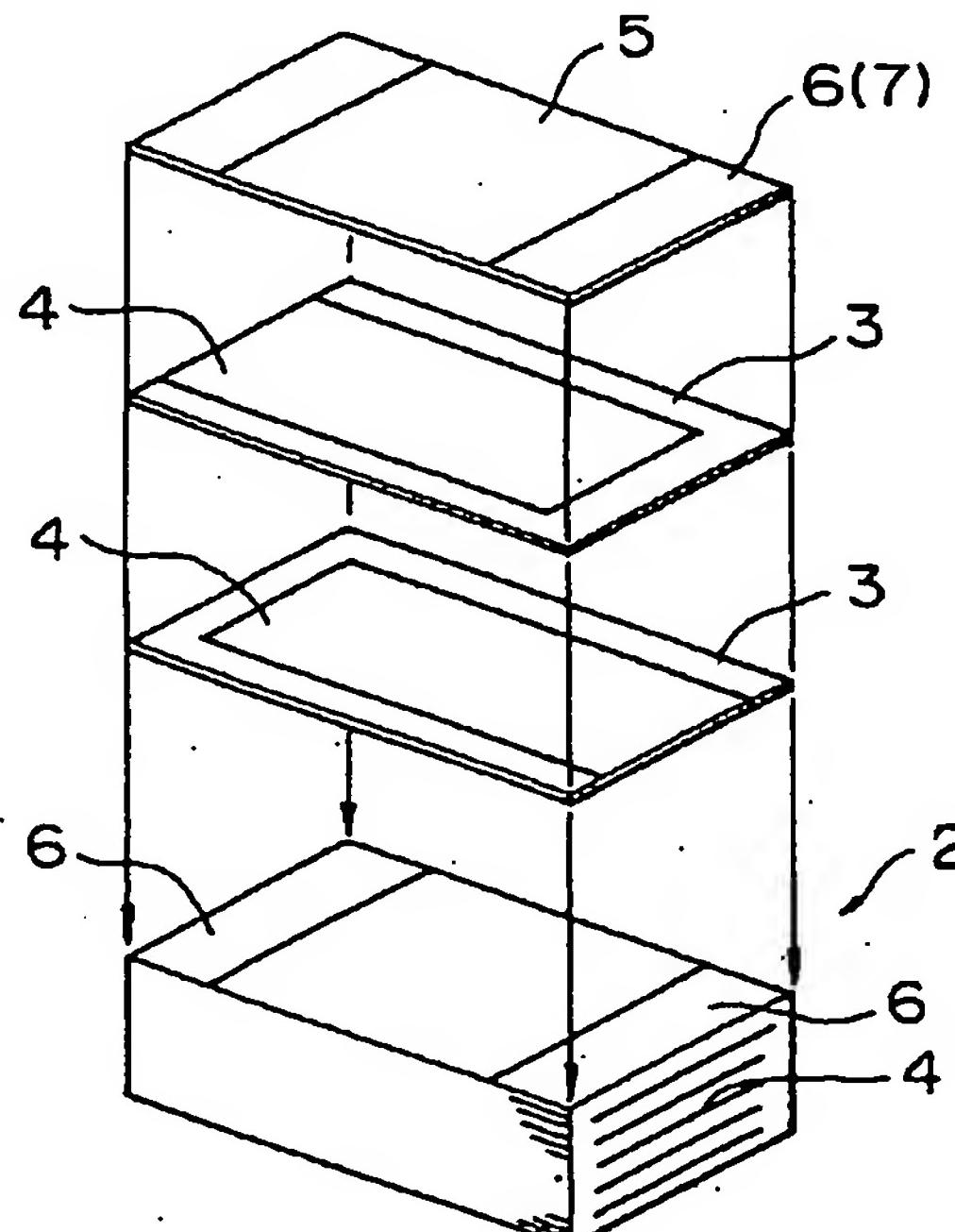
(74)代理人 弁理士 鈴木 弘男

(54)【発明の名称】積層電子部品のパンプ形成方法

## (57)【要約】

【目的】 本発明の目的是、従来のパンプの製造行程を大きく変更することなく、容易且つ確実に積層電子部品にパンプが形成できる方法を提供すること。

【構成】 両端にハンダに対して濡れ性のない金属の外部電極6を印刷したセラミックシート5をセラミックシート3と内部電極4の最外層に積層して、全体を焼成する。次に、外部電極6に下部電極12を接続させて内部電極4と連結させるとともに外部電極6にハンダに対して濡れ性を有するパンプ電極11をパンプ取り付け位置に合わせて印刷し、このパンプ電極11にハンダを盛りつけパンプ10を形成する。



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## 【特許請求の範囲】

【請求項1】 積層電子部品の上面あるいは下面の両端にハンダ濡れ性の少ない金属を塗布し、これを焼成して外部電極に形成し、当該外部電極上にハンダ濡れ性の良好な金属をバンプ取り付け位置に塗布し、溶融したハンダを前記外部電極に付与してハンダを前記バンプ取り付け位置に付着させてバンプを積層電子部品に形成することを特徴とした積層電子部品のバンプ形成方法。

【請求項2】 請求項1に記載の積層電子部品が積層コンデンサであり、当該積層コンデンサの内部電極を、当該積層コンデンサの側面に下部電極を設けて一体に接続するとともに当該下部電極と外部電極を接続させることとした積層コンデンサのバンプ形成方法。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 本発明は、積層コンデンサ等の積層電子部品にバンプを取り付ける場合のバンプの形成方法に関する。

## 【0002】

【従来の技術】 近年、電子装置の小型化が望まれており、その電子装置の小型化を達成するため内部に用いる電子部品を小型化することと共に、数多くの電子部品を一定の面積の基板内にできるかぎり組み込む高密度実装の実施が望まれてきている。このような電子部品の高密度実装を実現させるひとつの方法として、バンプを用いた電子部品の取り付け方法が知られている。

【0003】 例えば、電極と誘電体を積層してなる積層コンデンサ等にバンプを形成する場合、内部電極が露出した両端面に金属を取り付けて個々の内部電極を接続するとともにこの金属をこの積層コンデンサの下面に延ばし、そこにバンプを設けるようにしていた。

【0004】 詳しくは、積層コンデンサの両側面に、まずAg/Pb等を焼き付けて下部電極を作り、その下部電極の上にNi等をメッキにより取り付けて中間電極を設け、そして更にハンダをメッキして外部電極を形成してそこにバンプを設けるようにしていた。

## 【0005】

【発明が解決しようとする課題】 このように、金属をコンデンサの端面及び下面や上面に取り付けなければならぬので、通常の場合、コンデンサを、溶融させた金属内に端面を下に向かた状態で、金属がコンデンサの下面に付着するまで入れて行っていた。したがって、コンデンサを引き上げた際コンデンサの周囲に付着した金属が自重により下方に溜ったり、又表面張力により丸まることより、形成された電極の表面がコンデンサの下面に対して傾斜てしまい、この外部電極にバンプを取りつける場合に非常に取り付けにくくなることがあった。しかも、バンプを形成するためにバンプ取り付け位置以外の部分に絶縁用のレジストを塗布しなければならず手間がかかり、加えてコンデンサ自体の大きさが非常に小さい

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ことから扱いにくく、製造にかかるコストが上昇していた。

【0006】 更に、側面に金属を設ける代わりにスルーホールを形成して個々の内部電極を接続させるものも知られているが、このスルーホールの形成には、積層した後にドリル等により各電極を貫く穴を設け、この穴の内面に金属を塗布しなければならず製造に手間がかかるという問題があった。

【0007】 本発明は、従来の積層電子部品のバンプ形成行程に大幅な変更を施すことなくこれを活用でき、しかも容易且つ確実に積層電子部品にバンプが形成できる方法を提供することを目的とする。

## 【0008】

【課題を解決するための手段】 そこで、本発明では、上記課題を解決するため、積層前にセラミックシートの両端部にハンダに対して濡れ性のない金属を印刷しておき、内部電極とセラミックシートとを順次積層した後このセラミックシートを電子部品の外表面に積層する。その後このセラミックシートを内部電極とともに焼成して、積層電子部品の外表面に、印刷した金属の焼成による外部電極を形成する。次に、このようにして形成した外部電極にハンダ濡れ性を備えた金属をバンプ取り付け箇所に印刷してバンプ電極を設け、このバンプ電極にハンダを盛りつけバンプを形成するようにしたのである。尚、内部電極と外部電極とは、別途電気的に接続する。

## 【0009】

【作用】 外部電極はセラミックシートの表面に直接印刷等により塗布され焼成して形成されるので、焼成後は表面が平坦に形成され、その表面にバンプ用の電極を印刷するにも容易に行うことができ、かつ外部電極はバンプに対して濡れ性を有しないのでバンプ電極にのみバンプ用のハンダが盛りつけられて簡単に、かつ確実にバンプを形成できる。

## 【0010】

【実施例】 以下、本発明にかかるバンプの形成方法の実施例について図面を用いて説明する。

【0011】 図1にコンデンサ2の分解組み立て図を示す。（図では説明の都合上上下を逆にしてある。）セラミックシート3は、チタン酸バリウムのような誘電体セラミックからなり、このセラミックシート3の表面に内部電極4が形成してある。内部電極4は、銀系あるいは銅系の金属を印刷したもので、それぞれの電極毎に交互にセラミックシート3に印刷され、それぞれの電極毎に異なる端部に延長され、セラミックシート3を積層すると内部電極4の端部がコンデンサ2の端面に露出するようになっている。これらセラミックシート3と内部電極4を順次積層し、その最下層に、両端にタンクステン7を印刷により塗布したセラミックシート5を重ね合わせる。

【0012】 こうして、セラミックシート3と内部電極

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4とセラミックシート5を積層した後、全体を焼成すると、コンデンサ2が形成されるとともにセラミックシート5の両端にタングステン7からなるハングダに対して濡れ性のない外部電極6が形成される。

【0013】次に、この外部電極6の表面に図2に示すようにパンプ電極11を2か所ずつ両端各々の外部電極6に印刷する。パンプ電極11の印刷は、ハングダに対して濡れ性のある銀を用いる。そして、更にコンデンサ2の両側にそれぞれ下部電極12をそれぞれの側の外部電極6に接続させて取り付ける。この下部電極12は導電性を有していればよく、金属の種類は特に問わない。次に、このパンプ電極11にハングダを盛り付け、パンプ10を図3に示すように4か所形成する。図4にコンデンサ2をパンプ10を介して基板20上に取り付けた状態を示す。

【0014】したがって、本実施例の形成方法によれば、パンプ10を取り付ける外部電極6が印刷、及びその後の焼成によって形成されるので表面を平坦にでき、しかもハングダに対して濡れ性を有しないので、レジストを新たに塗布する必要がなく容易にかつ確実にパンプを従来のパンプ取り付け装置を大幅に変更させることなくコンデンサ2に形成することができる。

【0015】尚、本実施例では外部電極6をタングステン7により形成したが、本発明では外部電極6はハングダに対して濡れ性がなければよく、クロム等他の金属であってもよい。また、パンプ電極11を銀を用いて印刷により形成したが、同様にこれはハングダに対して濡れ性があればよく、銀の他、金、銅、銀と鉛との合金等であってもよく、又形成手段を蒸着等の他の方法によって行つてもよい。

【0016】更に、本発明はコンデンサに限らず、多層

基板等積層により製造される電子部品であれば、その表面にパンプを取り付ける場合の形成方法として応用可能である。

【0017】

【発明の効果】以上述べたように、本発明のパンプ形成方法によれば、焼成前に積層部品の外表面にあたるセラミックシートにハングダ濡れ性のない金属を印刷しておき、この金属を焼成により平面性の高い外部電極に形成し、この外部電極にパンプ取り付けの電極をハングダ濡れ性の良好な金属により印刷して、このパンプ電極にパンプを取り付けることにしたので、パンプ取り付け面を平面性の高いものにでき、パンプを容易且つ確実に取り付けることができ、しかも従来のパンプ形成に用いた装置を大幅に変更することなく利用でき、非常に量産性の高い有効なパンプ形成方法を提供できる。

【図面の簡単な説明】

【図1】本発明にかかるパンプの形成方法を説明するコンデンサの分解斜視図である。

【図2】本発明にかかるパンプの形成方法を説明するコンデンサの分解斜視図である。

【図3】本発明にかかるコンデンサの斜視図である。

【図4】本発明にかかるコンデンサを基板上に取り付けた状態を示す正面図である。

【符号の説明】

2 コンデンサ

3 セラミックシート

4 内部電極

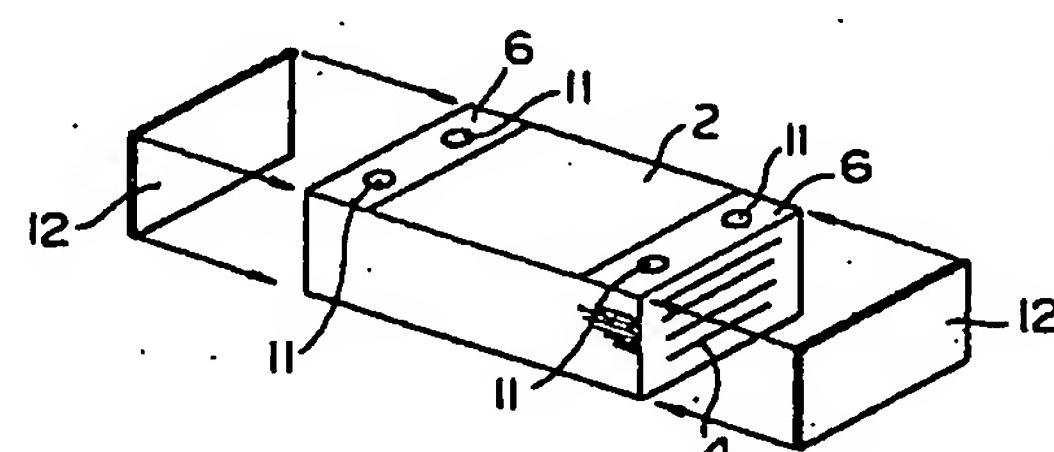
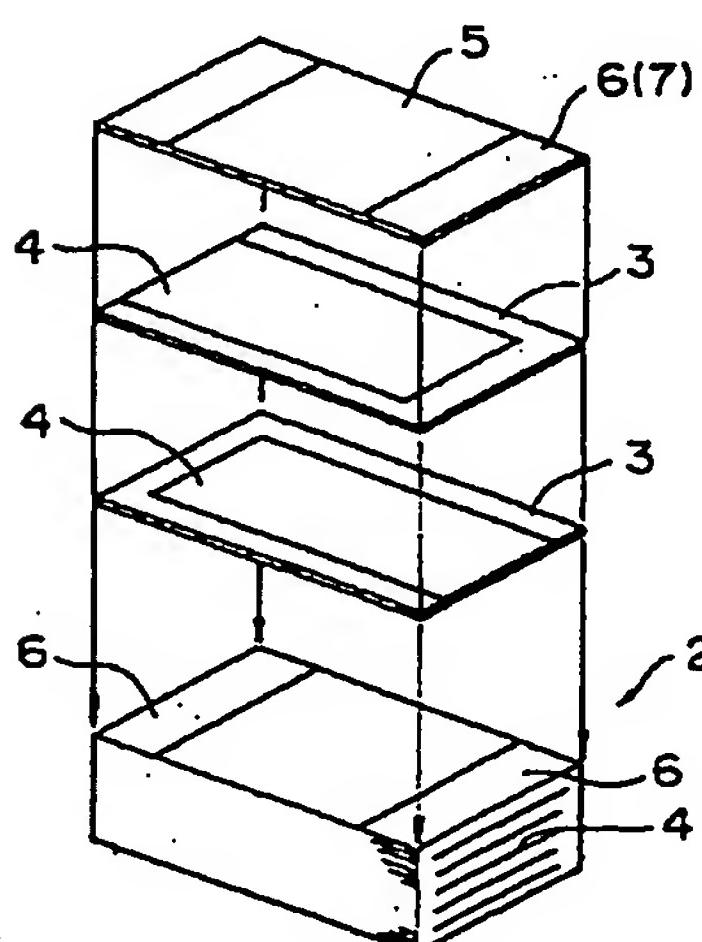
5 セラミックシート

6 外部電極

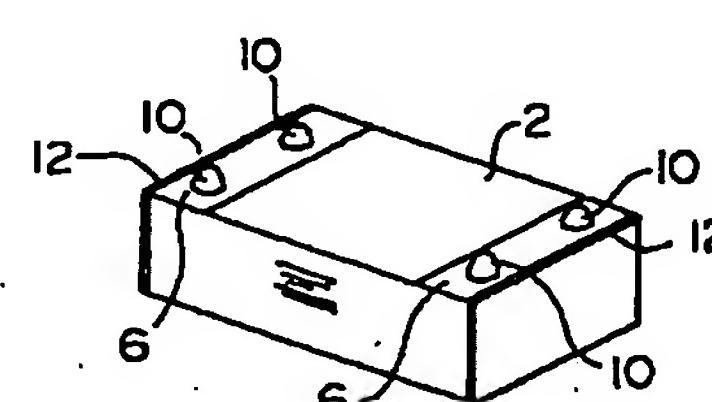
10 パンプ

11 パンプ電極

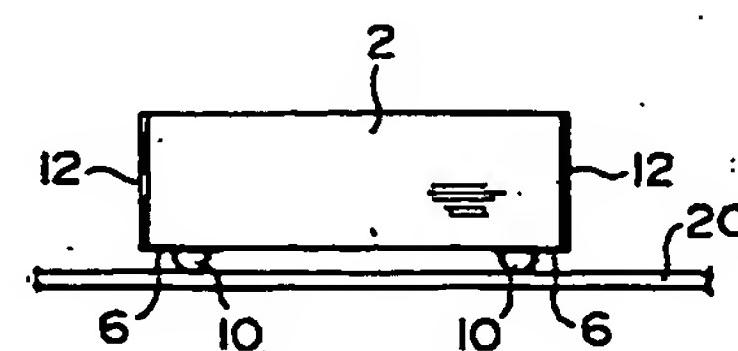
【図1】



【図3】



【図4】



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(21) Application number : 04-204526 (71) Applicant : MURATA MFG CO LTD  
(22) Date of filing : 07.07.1992 (72) Inventor : SARUTA SADAKICHI

(54) METHOD FOR FORMING BUMP OF LAYERED ELECTRONIC PARTS

(57) Abstract:

PURPOSE: To obtain a method for forming a bump on layered electronic parts easily and positively without changing a conventional bump-manufacturing process greatly.

CONSTITUTION: A ceramic sheet 5 where an external electrode 6 of a metal without any wetting property for solder is printed at both edges is stacked on a ceramic sheet 3 and the outermost layer of an internal electrode 4 and the entire part is calcined. Then, a lower electrode 12 is connected to the external electrode 6 for interlocking to the internal electrode 4 and at the same time a bump electrode 11 with wetting property for solder is printed at the external electrode 6 while being matched to the bump-mounting position and then bump is piled up on the bump electrode 11, thus forming a bump 10.

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CLAIMS

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## [Claim(s)]

[Claim 1] The bump formation approach of the laminating electronic parts characterized by to apply few metals of pewter wettability to the both ends of the top face of laminating electronic parts, or an inferior surface of tongue, to calcinate this, to form in an external electrode, to give the pewter which applied the good metal of pewter wettability to the bump installation location, and fused it to said external electrode, to make a pewter adhere to said bump installation location, and to form a bump on the external electrode concerned at laminating electronic parts.

[Claim 2] The bump formation approach of the multilayer capacitor carried out to connecting a lower electrode and an external electrode concerned while it is a multilayer capacitor, and laminating electronic parts according to claim 1 prepare a lower electrode in the side face of the multilayer capacitor concerned and connect the internal electrode of the multilayer capacitor concerned to one.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

## [0001]

[Industrial Application] This invention relates to the formation approach of the bump in the case of attaching a bump in laminating electronic parts, such as a multilayer capacitor.

## [0002]

[Description of the Prior Art] In recent years, a miniaturization of an electronic instrument is desired and operation of the high density assembly incorporated [ whether much electronic parts are made in the substrate of a fixed area with miniaturizing the electronic parts used for the interior, in order to attain the miniaturization of the electronic instrument, and ] has been desired. The mounting arrangement of electronic parts using the bump as one method of realizing high density assembly of such electronic parts is known.

[0003] For example, when forming a bump in the multilayer capacitor which comes to carry out the laminating of an electrode and the dielectric, while attaching a metal in the both-ends side which the internal electrode exposed and connecting each internal electrode, he extends this metal on the inferior surface of tongue of this multilayer capacitor, and was trying to prepare a bump there.

[0004] Ag/Pb etc. can be burned first, a lower electrode is made, nickel etc. is attached by plating on the lower electrode, and a bipolar electrode is prepared in the both-sides side of a multilayer capacitor, and a pewter is plated further, and he forms an external electrode, and was trying to prepare a bump there in detail.

## [0005]

[Problem(s) to be Solved by the Invention] Thus, in the usual case, since the metal had to be attached in the end face and inferior surface of tongue, and top face of a capacitor, where an end face is turned downward in the metal to which melting of the capacitor was carried out, it put in and had gone until the metal adhered to the inferior surface of tongue of a capacitor. Therefore, when a capacitor was pulled up, and the metal adhering to the perimeter of a capacitor collected caudad with a self-weight, and the front face of the formed electrode inclined from it being round with surface tension to the inferior surface of tongue of a capacitor and it attached a bump in this external electrode, it might very be hard coming to attach. And in order to form a bump, the resist for an

insulation had to be applied to parts other than a bump installation location, and time and effort was taken, and in addition, it was hard to treat from the magnitude of the capacitor itself being very small, and the cost concerning manufacture was going up.

[0006] Furthermore, although that to which a through hole is formed in and each internal electrode is connected was also known instead of preparing a metal in a side face, after carrying out a laminating, the hole which pierces through each electrode with a drill etc. was prepared, the metal had to be applied to the inside of this hole and there was a problem that manufacture took time and effort in formation of this through hole.

[0007] This invention can utilize this, without performing large modification to the bump formation stroke of the conventional laminating electronic parts, and aims at offering the approach of moreover a bump forming in laminating electronic parts easily and certainly.

[0008]

[Means for Solving the Problem] So, in this invention, in order to solve the above-mentioned technical problem, the metal which does not have wettability to a pewter is printed to the both ends of a ceramic sheet in front of the laminating, and after carrying out the laminating of an internal electrode and the ceramic sheet one by one, the laminating of this ceramic sheet is carried out to the outside surface of electronic parts. This ceramic sheet is calcinated with an internal electrode after that, and the external electrode by baking of the metal printed to the outside surface of laminating electronic parts is formed. Next, the metal which equipped with pewter wettability the external electrode which carried out in this way and was formed is printed in a bump installation part, a bump electrode is prepared, a pewter is dished up to this bump electrode, and the bump was formed. In addition, an internal electrode and an external electrode are connected electrically separately.

[0009]

[Function] After baking can be performed easily also for a front face being evenly formed, since an external electrode is applied to the front face of a ceramic sheet by direct printing etc., is calcinated and it is formed, and printing the electrode for bumps on the front face, and since an external electrode does not have wettability to a bump, the pewter for bumps can dish it up only to a bump electrode, and it can form a bump simply and certainly.

[0010]

[Example] Hereafter, the example of the formation approach of the bump concerning this invention is explained using a drawing.

[0011] The decomposition assembly Fig. of a capacitor 2 is shown in drawing 1. (In drawing, the bottom of explanation convenience being very best is made reverse.) The ceramic sheet 3 consists of a dielectric ceramic like barium titanate, and the internal electrode 4 is formed in the front face of this ceramic sheet 3. It is what printed the metal of a silver system or a copper system, an internal electrode 4 is printed by the ceramic sheet 3 by turns for every electrode, and is extended at the different edge for every electrode, and if it carries out the laminating of the ceramic sheet 3, the edge of an internal electrode 4 will expose it to the end face of a capacitor 2. The laminating of these ceramic sheet 3 and the internal electrode 4 is carried out one by one, and the ceramic sheet 5 which applied the tungsten 7 to both ends by printing is laid on top of the lowest layer.

[0012] In this way, if the whole is calcinated after carrying out the laminating of the ceramic sheet 3, an internal electrode 4, and the ceramic sheet 5, while a capacitor 2 is formed, the external electrode 6 which does not have wettability to the pewter which consists of a tungsten 7 will be formed in the both ends of the ceramic sheet 5.

[0013] next, on the front face of this external electrode 6, as shown in drawing 2, it prints the bump electrode 11 two places at a time to the external electrode 6 of each both ends. Printing of the bump electrode 11 uses the silver which has

wettability to a pewter. And further, it is made to connect with each near external electrode 6, and the lower electrode 12 is attached in the both sides of a capacitor 2, respectively. This lower electrode 12 does not ask especially a metaled class that what is necessary is just to have conductivity. Next, a pewter is dished up to this bump electrode 11, and a bump 10 is formed four places, as shown in drawing 3. The condition of having attached the capacitor 2 on the substrate 20 through the bump 10 at drawing 4 is shown.

[0014] Therefore, since according to the formation approach of this example a front face can be made flat since the external electrode 6 which attaches a bump 10 is formed of printing and subsequent baking, and it moreover does not have wettability to a pewter, it is not necessary to newly apply a resist, and a bump can be formed in a capacitor 2 easily and certainly, without making conventional bump installation equipment change sharply.

[0015] In addition, although the external electrode 6 was formed with the tungsten 7 in this example, chromium etc. may be other metals in this invention that the external electrode 6 should not just have wettability to a pewter. Moreover, although the bump electrode 11 was formed by printing using silver, that there should just be wettability to a pewter, this may be the alloy of others, gold, copper, silver, and lead etc., and may perform means forming by other approaches, such as vacuum evaporationo, similarly. [ silver ]

[0016] Furthermore, if this invention is electronic parts manufactured not only by the capacitor but by the multilayer substrate equivalence layer, it is applicable as the formation approach in the case of attaching a bump in the front face.

[0017]

[Effect of the Invention] As stated above, according to the bump formation approach of this invention, the metal which does not have pewter wettability in the ceramic sheet which hits the outside surface of laminating components before baking is printed. Since it decided to form this metal in the high external electrode of smoothness by baking, to print the electrode of bump installation with the good metal of pewter wettability to this external electrode, and to attach a bump in this bump electrodeThe bump clamp face is made to the high thing of smoothness, and a bump can be attached easily and certainly, and it can use, without changing sharply the equipment moreover used for the conventional bump formation, and the effective bump formation approach that mass-production nature is very high can be offered.

#### DESCRIPTION OF DRAWINGS

##### [Brief Description of the Drawings]

[Drawing 1] It is the decomposition perspective view explaining the formation approach of the bump concerning this invention of a capacitor.

[Drawing 2] It is the decomposition perspective view explaining the formation approach of the bump concerning this invention of a capacitor.

[Drawing 3] It is the perspective view of the capacitor concerning this invention.

[Drawing 4] It is the front view showing the condition of having attached the capacitor concerning this invention on the substrate.

##### [Description of Notations]

2 Capacitor

3 Ceramic Sheet

4 Internal Electrode

5 Ceramic Sheet

6 External Electrode

10 Bump

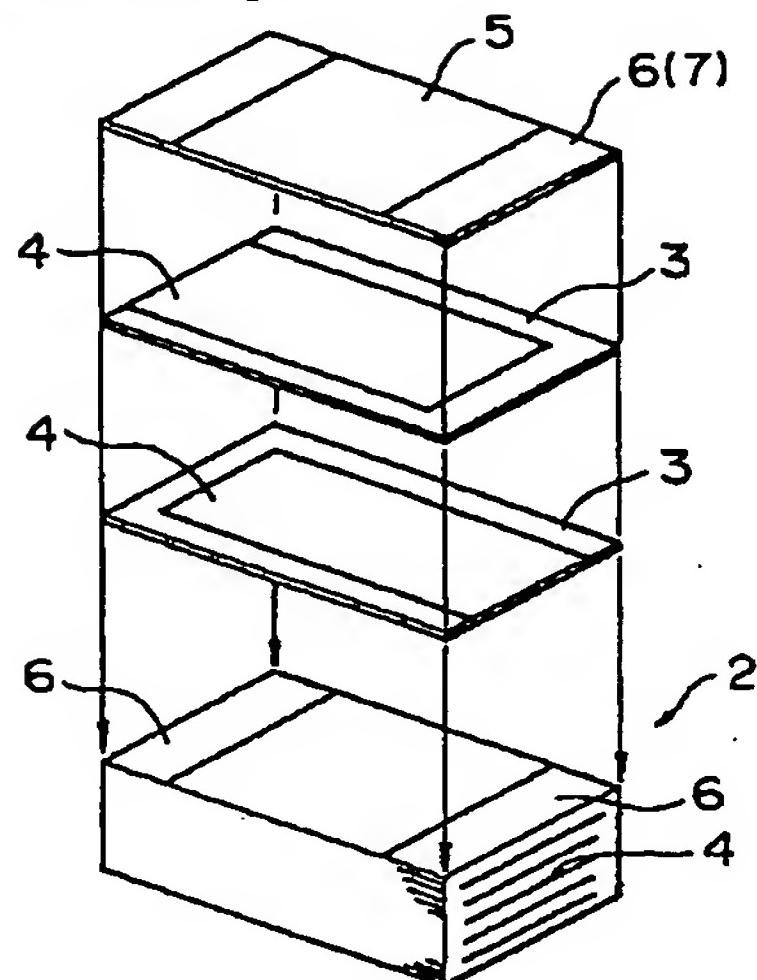
11 Bump Electrode

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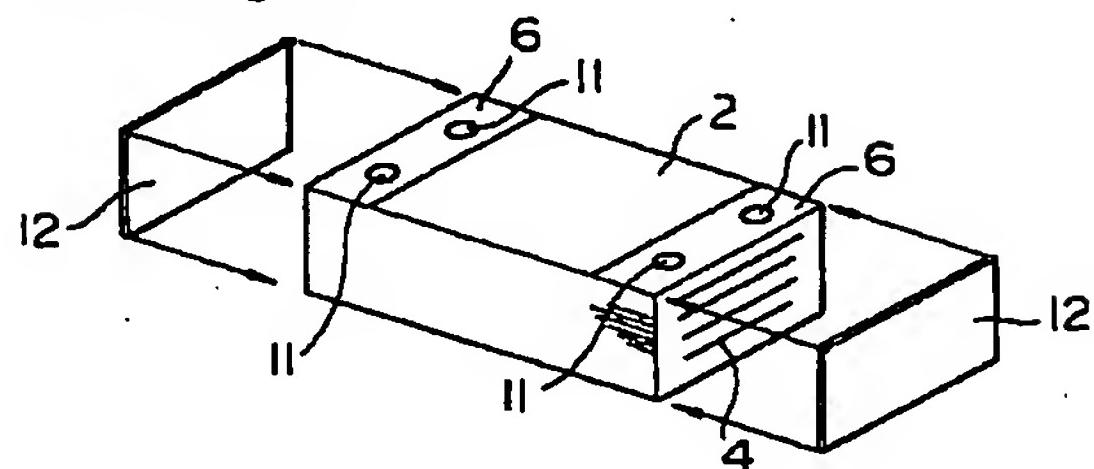
DRAWINGS

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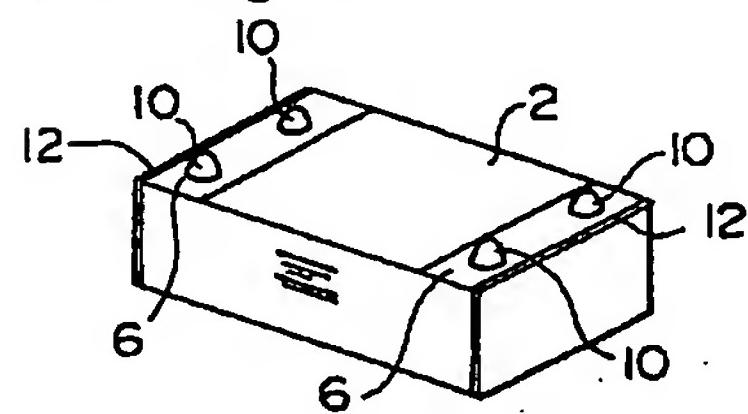
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Drawing 4]

